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NOTES ON THE WHARF BORER (NACERDA MELANURA L.)

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September 23, 1935, the writer examined the wharf of the Atlantic Sugar Refineries Limited at Saint John, N.B., which was under reconstruction owing to "decay" of the timbers. The officials of the company had discovered that these timbers had been riddled by borers which proved to be the larvae of an oedemerid beetle, *Nacerda melanura* L. As the references to this insect in the literature are scant and there is uncertainty as to its economic importance, the following notes are presented.

A considerable amount of information was provided by Mr. A. F. Blake, Manager, and other officials of the company, and by Mr. J. F. Harkom of the Forest Products Laboratory of Canada, who inspected the wharf at the same time. Mr. J. J. de Gryse of the Dominion Entomological Branch, Ottawa, has also supplied a number of records. The insect was first identified by Prof. Wm. F. Clapp of Duxbury, Mass.

The Literature. Broun (1902) reported severe injury to paving blocks and supporting timbers of a street near a wharf in New Zealand. He notes that "this species, in England, commonly attacks all sorts of timber, posts, etc., adjacent to salt water; in fact, maritime situations appear to be its permanent abode." Blatchley (1910) notes that *Nacerdes melanura* L. is scarce in Indiana but found occasionally about cellars, old boxes and lumber yards. He considers it originally came from Europe. Escherich (1923) states that *Nacerdes melanura* breeds, in Germany, in old oak and fir which is periodically wetted by sea water. Imms (1930) refers to the species as occurring on the coast among piles or old cast-up timber.

The American Railway Engineering Association's Committee on Wood Preservation (1932) describes damage above mean highwater to piles near New York City and Brooklyn, N.Y., and gives records obtained from Dr. T. E. Snyder of its occurrence at the following points in the United States:

Baltimore, Md., 1909—in yellow pine piling at mud line, 4 feet below mean low water.

Norfolk, Va., 1930—in creosoted conduit 3 feet below street level near enough to waterfront for it to be affected occasionally by salt water seepage.

New Orleans, La., 1915—in 8-year old pine wharf piling (16-lb. English creosote per cubic foot) at ground line not reached by high water of Mississippi since 1912.

Magazine Point, La., 1915—in 16-year old pine telephone pole (creosoted at 12 lbs. per cubic foot).

Bloomington, Ga., 1915—in 10-year old cedar telephone pole (two coats coal creosote).

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Other records are given of adults taken on the coasts of New Jersey and Puget Sound, Washington, and at St. Louis, Mo. Larvae were taken from decaying white pine flooring on the ground floor of a house in Washington, D. C. It is noted that the base of telephone poles and fences are sometimes attacked where dogs have urinated. Schedl (1934) reports from Germany severe infestation in floor beams just above the level of the bilgewater on a lighter.

Recently, several notes have appeared in the "Entomologist's Monthly" regarding this insect's occurrence in England. Laing (1936) gives records of injury to wharves, sleepers, etc., and draws particular attention to the common occurrence of the insect in London where the adults have frequently been taken on pavements or in basements in the heart of the city and attracted considerable attention. Mr. Laing writes that swarms of the beetle have been reported in increasing numbers during the past six or seven years and considers that partially buried wood used in building is largely responsible. One instance is given of living larvae being found in wood which had been entirely surrounded by concrete for seven years.

Two recent records in Canada may be mentioned. Twinn states in the Canadian Insect Pest Review for 1933 that the beetle was breeding in decaying wood beneath the floor of a gasolene station in Ottawa and the adults caused annoyance inside the station during the summer months. A report has also been received of large numbers of the adults occurring in a newspaper office in Toronto and being apparently attracted to toilets.

Distribution. In addition to the above, the insect is recorded from Denmark, Siberia, Japan, and the Bahama Islands. In the United States it has been found in most of the coastal states and also in Michigan, Indiana, Missouri, Kansas and New Mexico. In Canada it has been taken as follows: Hastings Co., Ont., 1897; Halifax, N.S., 1898, 1899, 1900, 1901, 1902; Sable Island, N.S., no date (collected by Macoun, who visited the island in 1899); Ottawa, Ont., 1906, 1920, 1932, 1933; Granville Ferry, N.S., 1908; Yarmouth, N.S., 1911; Smith's Cove, N.S., 1914; Fort Coulonge, Que., 1917; Aylmer, Que., 1923; St. Thomas, Ont., 1924; Montreal, Que., 1926; Nanaimo, B.C., 1928; Vancouver, B.C., no date; Winnipeg, Man., 1931; Toronto, Ont., 1934; Saint John, N.B., 1935.

There are no doubt a number of other records in less accessible literature but it is evident from the above that the insect is widely distributed throughout the world, as would be expected in the case of a species so closely associated with shipping. Although it appears to be far more numerous near the coast it is by no means dependent on maritime conditions and occurs in localities over a thousand miles from the sea.

In view of the fact that this insect has been present in Nova Scotia and Ontario for forty years or more, it can hardly be looked upon as a recent introduction to this continent.

Description of Insect and Habits. The adult is somewhat narrow and depressed, about 10 mms. long, brownish to reddish yellow above with the tips of the elytra, the eyes, sides of the thorax, legs and ventral parts generally blackish, the whole body covered with a rather dense yellow pubescence. The elytra are pointed and each has four more or less evident raised lines. The antennae are rather more

than half the length of the body.

Adults have been seen in large numbers around the wharf at Saint John during July and August and it would appear that the period of emergence and oviposition extends over several weeks, and possibly two months. Only dead specimens were found on September 23rd.

It appears from the records that salts, or some other substances, in sea water and urine may attract the beetles. Information has just been received that damage is being done to the wharves of another sugar-refining company, near Halifax, N.S., by what seems likely to be *N. melanura* although material is not available for identification. This suggests the possibility that the sugar on these wharves may also be attractive to adults.

The larvae are about 30 mms. long when full-grown, much constricted between the segments, cream coloured, with the mouthparts brown and the mandibles almost black at the tips. The verrucae, or ambulatory warts, are well developed on the dorsal side of the thoracic and first two abdominal segments, being paired except on the second abdominal segment, where they are fused. On the ventral side, verruca are present only on the third and fourth segments. The body is sparsely covered with rather long, slender, brown setae which are arranged in definite rows along the dorsal anterior margin of the prothorax, and across the posterior dorsal part of abdominal segments 2 to 8. The legs are armed on the inner sides with numerous short brown spines.

On September 23rd, larvae of all sizes from 10 to 30 mms. were found, but no eggs or pupae. Pieces of infested wood were brought into the laboratory and kept under moist conditions at 70° to 75° F. throughout the winter but on April 15th many small larvae were still present and no adults had appeared although a few pupae had formed. The larvae appeared healthy but evidently only a little development had taken place. It appears that at Saint John the larvae overwinter in many different stages, the larger of which pupate early in the season while the smaller may possibly not pupate until the following year. The generations evidently overlap considerably and in this climate the insect may take two or more seasons to complete its development. Farther south, the life cycle is doubtless more rapid and possibly development is continuus.

The galleries are oval in cross-section and extend, for the most part, lengthwise with the grain. Sometimes they follow the "springwood" for several inches. They are plugged with fine frass. Finally, a pupal cell is formed by partitioning off the last inch of the gallery with coarse shreds of wood packed at both ends. The adult makes its way out by chewing a more or less circular hole direct to the surface.

The pupa is about 10 mms. long, noticeably small compared with the adult, cream coloured and semi-transparent, rather sparsely clothed with long, slender, pale-brown setae. The abdomen is depressed and bears from two to four unequal pointed protuberances on each side of the third to sixth segments, and two median and two lateral pointed protuberances on the last segment.

Damage. The wharf at Saint John consisted of a 12" x 12" timber crib of untreated pine, hemlock and Douglas fir. The timbers between the flooring and the high water level were, for the most part, badly decayed and riddled with the galleries of the borer, as were also the planks on the inside face which were against

the earth fill. It was found necessary to replace these parts of the wharf. Some of the pieces were almost completely honeycombed with the insect's tunnels and could be pulled apart with the hand although there was little sign of the damage on the outside. Others had been attacked only an inch or two from the surface of the wood and were sound inside or were affected only on one side or at the ends. Most of the wood which was not completely destroyed still contained larvae.

No injury was done to piling or other timber which was submerged at high tide, or to any parts which were fully exposed to the drying effect of the sun and wind. There could be little doubt that the borer was not capable of causing damage to wood which was not kept moist. It seemed to be flourishing best where the wood was constantly damp owing to poor ventilation and particularly where, in summer time, the temperature would also be rather high owing to the heat of the sun on the sheds above the cribwork.

Relation to Moisture and Fungi. Larvae were found only in wood which felt damp to the touch. Two lots of infested wood were kept in the laboratory from September 23rd to April 17th, one in a large tub containing an inch of tap water and covered with canvas, the other uncovered in an air humidity of approximately 50 per cent. The temperature in both cases ranged between 50° and 60° F. In the spring the larvae were living in both lots but appeared more active and healthy in the damp wood. Two pupae were found in the damp, none in the dry, lot but there had not been much development in either.

Most of the galleries, and many of the living larvae, were in wood which was definitely rotten. A considerable number of the larvae, however, were boring in wood which was apparently quite sound, although they were all within about an inch of at least partially rotted wood. It was clear that they were quite capable of feeding in sound wood, but that for some reason they did not go far from the parts which were already invaded by wood rots. This may have been due to the fact that they were in some way dependent on the fungi attacking the wood or on the more moist conditions prevailing near the surface or near the rotten areas.

All of the references in the literature suggest an association with damp conditions, with, perhaps, a preference for salt water. Mr. Laing reports that the wood buried in concrete which he found infested was remarkably dry and free from rot but that probably the concrete imparted a certain amount of moisture to it. Possibly lack of choice forced the insect to breed in drier wood than it would normally have chosen. It may be able to develop only slowly under such conditions.

In order to throw some light on the nature of the association with wood-rotting organisms, samples of pine timbers were sent to Dr. C. W. Fritz, of the Forest Products Laboratories of Canada, who kindly made cultures from points where galleries penetrated into apparently sound parts of the wood. Of thirteen cultures, ten contained a fungus of a mould type associated neither with stain nor decay but frequently obtained from freshly cut pine or wood in service. In two cultures, *Hormonema dematioides* Lagerberg and Melin develop. This fungus causes bluestain. In the thirteenth, another fungus with colourless mycelium and profuse sporulation was found. No wood-rotting fungi were obtained. Dr.

Fritz considers that the mould was probably present before the insect but the other two entered with it or afterwards.

Hendee (1935) has shown that the termite, *Zootermopsis angusticollis* (Hagen), feeds on both sound and rotten wood, but a diet of fungus-free wood alone reduces the rate of growth and viability and increases cannibalism. It may be that *N. melanura* is similarly dependent on wood-rotting fungi for normal development. However, the hypothesis that the insect is dependent only on moist conditions in the wood and that the association with fungi is accidental owing to the preference of both organism for a similar environment seems to be more fully supported by the evidence at present available.

Prevention. It should be determined experimentally whether the insect attacks sound wood and introduces rot or whether it attacks only such wood as has already been invaded by the fungus. In any case, however, there is no doubt that the insect and the rot thrive under similar conditions. While the insect hastens the penetration of the rot and the failure of the wood, it seems unlikely that it will cause much damage except under conditions favourable to the development of rot and where, for this reason alone, treatment is necessary to ensure long life.

Under these damp conditions, creosote, applied by the pressure method, is the only preservative recommended. The case of *Nacerda* attack on creosoted wood referred to in the literature would appear to be due to inadequate treatment or to the cutting of timbers after treatment.

A rather hasty examination of other wharves in the Saint John harbour did not disclose any other attacks. This is attributed to the fact that the other structures examined were all sufficiently open to permit good ventilation. The maximum amount of ventilation between the floor and high water should be secured in construction over water or damp ground.

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A NEW MACROMIA FROM BRITISH COLUMBIA (ODON. CORDULIIDAE).

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While stationed at the Dominion Biological Laboratory at Cultus Lake, B. C., and conducting investigations on the sockeye salmon, Dr. W. E. Ricker spent some of his leisure time in collecting certain groups of aquatic insects and has generously presented the bulk of the material to the Royal Ontario Museum of Zoology. The Odonata, which were kindly sent to the writer, were collected in a most discriminating manner and include some interesting species hitherto unknown to the region. One new species, a *Macromia*, is described herewith, while the collection as a whole will be reported upon in a future paper.

CAN. ENT. VOL. LXIX. PLATE I.

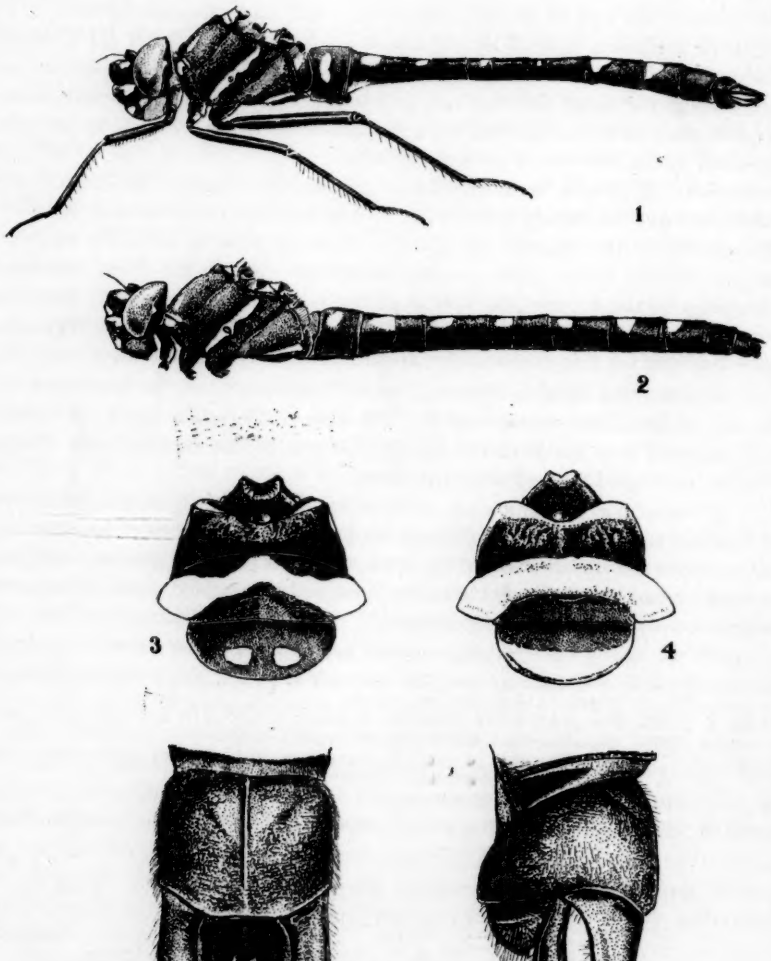

Fig. 1 *Macromia rickeri* n. sp., lateral view of male (wings and hairs omitted). Fig. 2 *M. rickeri*, lateral view of female. Fig. 3 *M. rickeri*, colour pattern of face (eyes and appendages omitted). Fig. 4 *M. magnifica*, same parts as fig. 3. Fig. 5 *M. rickeri*, anal appendages of male, dorsal view. Fig. 6 *M. rickeri*, anal appendages of male, lateral view.

The study of the taxonomic position of this and other species of *Macromia* was greatly facilitated by the opportunity of examining material in the Williamson collection afforded me through the kindness of Mrs. H. K. Gloyd, to whom I wish to express my sincere thanks.

No very satisfactory key to the North American species of *Macromia* has yet appeared. Williamson's paper ('09) contains sufficient data for the purpose but, unfortunately, no key was prepared. In Needham and Heywood's "Handbook" ('29) there is a brief key but the specific characters of North American Macromias are so slight that a key based chiefly on single characters is scarcely reliable. I have, therefore, taken this opportunity of preparing a key and, in so doing, I have made free use of the information given in Williamson's study but have verified all the characters used, except in the case of females of *M. pacifica* Hagen and *magnifica* McLachlan.

I have omitted Williamson's species *australensis* as this name seems to be a synonym of *georgina* Selys. Mrs. Gloyd drew my attention to this point in a letter and, after an examination of the specimens from the Williamson collection, I am convinced that she is right. Williamson noted the similarity of *M. georgina* to his new species *australensis* in all but the length of the antehumeral stripe but did not suggest that the two forms might be conspecific. In the absence of differential characters other than the length of the antehumeral stripe we are not justified in retaining *australensis* as a separate species.

Macromia rickeri n. sp.

A species about the size of *illinoiensis*, closely related to *M. magnifica*, from which it is structurally scarcely distinct but differs in the darker ground colour and more restricted yellow areas.

Measurements (millimeters)—Holotype ♂ : total length, 66; abd. (incl. apps.), 47; hind femur, 12; hind wing, 39.5. Allotype ♀ : total length, 65; abdomen, 46; hind femur, 12; hind wing, 42. Five males, four females: total length, ♂, 64-68, ♀, 65-70; abdomen, ♂ ♀, 46-50; hind femur, ♂, 12.0-12.5; ♀, 12-13; hind wing, ♂, 40-42, ♀, 41-43.5.

Male.—Front tibiae keeled on slightly more than their distal third; middle tibiae without trace of a keel; hind tibiae keeled except on about the proximal sixth. Abdomen expanding but little as far as seg. 6, more rapidly on 7, greatest breadth from distal end of 7 to that of 8, slightly narrower on 9 and 10, thickest at distal end of 8. Posterior hamules stout at base with the ventral margin proximally convex, tapering distally into slender styliform processes with the apices strongly hooked as in *M. magnifica*. Anal appendages (figs. 5, 6) very similar to those of *magnifica*, straight and regularly tapering as seen in profile, the apices scarcely upturned; as compared with other species, straighter, wider apart at base, and without any trace of an external lateral tooth. Inferior appendage no longer than the superiors, twice as long as its basal breadth.

Colour: head very dark brown, nearly black, with slight bluish reflections, the following parts yellow or yellowish: a small bilobate spot on the frontal vesicle, two larger, widely separated, rounded, pale yellow dorsal spots on frons, narrowly separated by the marginal ridge from the lateral spots, which are of similar size but somewhat deeper in colour; postclypeus, except a depressed spot on each side at the upper margin and the median part of the lower margin; a pair of spots

on the lower half of the labrum and another on the mandibles. Median lobe of labium pale yellow, its distal margin and the lateral lobes dark brownish. Pile of face blackish, not very dense. Eyes in alcoholic specimen green with the tubercle light yellow. Rear of head black.

Synthorax chocolate brown with dull greenish reflections, clothed with pale brownish-grey hairs, which are longest next to the anterior margin of the mesepisternum. Yellow areas of antealar sinus small, mesially divided. Yellow antehumeral stripe very short, separated from antealar sinus by a distance one-and-one-half to more than three times its own length. A yellow spot on the mesinfraepisternum, barely overlapping its upper margin but not contiguous with the antehumeral stripe. Metepisternal stripe narrow, not quite reaching the wing base, widest in the upper third, the hind edge excavate above, and also slightly below the spiracle. Latero-ventral metathoracic carina narrowly yellow. Legs black with the posterior surfaces of pro- and mesocoxae pale yellowish.

Wings hyaline with black venation, the costal vein in the alcoholic specimen showing a very narrow pale yellow sub-marginal line; pterostigmata black; membranule pale grey.

Abdomen dark greenish brown; seg. 2 with a pair of widely separated, transversely elongated, dorso-lateral yellow spots, extending ventrad over the auricles; yellow dorsal spots on 3-6 small, successively diminishing posteriorly, the spots on 3 extending from transverse carina two-thirds to three-quarters the distance toward the base of the segment, separated from one another dorsally by a narrow v-shaped space; spots on 4-6 separated mesially, becoming very small or even absent on 6; segs. 7 and 8 each with a large basal spot, the spot on 7 subtriangular, extending from base to transverse carina with a short mid-dorsal extension beyond the carina, the spot on 8 extending from base two fifths of the distance towards posterior margin, broadly angulate or rounded behind, usually with a small notch on each side; 9 and 10 wholly dark (In the alcoholic specimen there is a trace of a basal transverse yellow line.)

Female.—Similar in form to male, except for the usual differences in the abdomen. In all four specimens it is apparently somewhat unnaturally compressed and therefore appears in the figure (fig. 2) to be stouter than it would be in life. Anal appendages about as long as seg. 10, tapering to acute apices. Vulvar lamina represented by a slight thickening of the posterior edge of the sternum of 8, which is produced into an arcuate extension. Posterior to this, on st. 9, is a pair of short rounded processes, connected at base by a low transverse ridge.

Colour-pattern nearly as in the male. The yellow spots on abd. seg. 2 are not extended latero-ventrally; those on 3-6 are all mesially divided and of a more or less rounded form, decreasing in size posteriorly but usually to a much less extent than in the male. In one female from Hope they are nearly as large as in *M. magnifica.* On 7 and 8 the yellow spots are of about the same size as in the male and are undivided mesially. The remaining segments are without yellow markings.

Wings hyaline or faintly yellow in the adult specimens, decidedly flavescent in the tenerals.

Venation.—Antenodals, fore wings, ♂ ♀, 11-13, hind wings, ♂ ♀, 8-9; postnodals, fore wings ♂, 6-8, ♀, 7-8, hind wings, ♂ ♀, 7-9; average distance nodus to stigma in length of wing, f. w.,.286, h. w., .386; triangles and subtriangles in all wings free; antesubtrigonal cells in front wing, 2-3 (av. 2.28); cubito-anal cross-veins, f. w., 3 (4 in one wing), h. w., 3; first cubito-anal cross-vein in hind wing proximal to first antenodal; arculus in all wings between first and second antenodal and nearly always distal to second cubito-anal cross-vein in both pairs of wings; one supratrigonal cross-vein; 2-3 cross-veins over the bridge (3 in 66% in both wings of male; 4 in 1 fore wing of a female).

In general the venation appears to be indistinguishable from that of *magnifica* (v. Williamson, '09) differing from that of other species in its more open character.

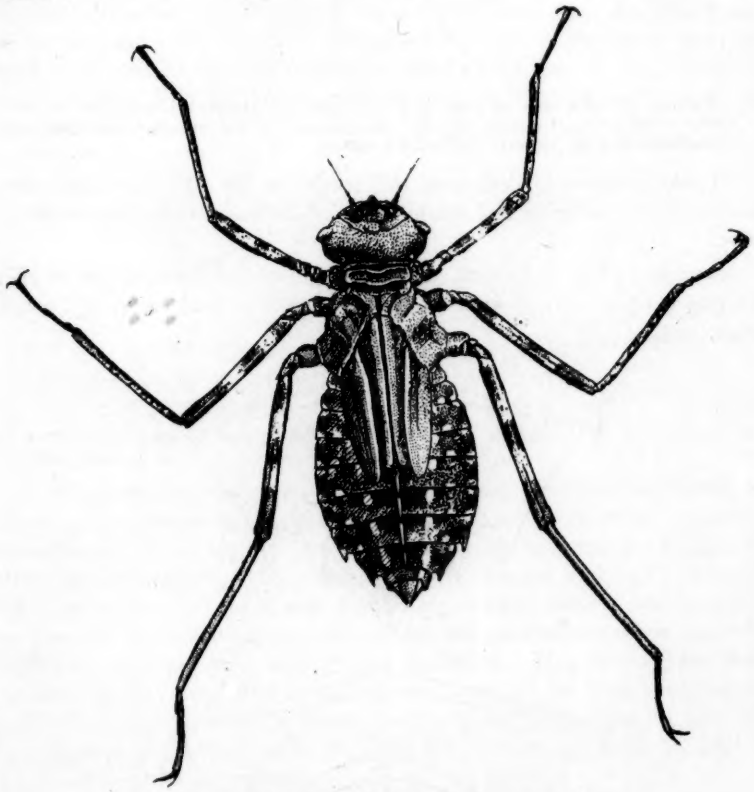

Fig. 1 *Macromia rickeri*, full grown nymph.

Holotype.— ♂, Cultus Lake, B. C., July 25, 1934 (W. E. Ricker): in the collection of the Royal Ontario Museum of Zoology.

Allotype— ♀. Cultus Lake, B. C., June 23, 1936 (W. E. Ricker): in the Royal Ontario Museum of Zoology.

Paratypes.—Cultus Lake, June, 1933, teneral male; July 5, 1934, 1 ♂; June 26; 1935, 3 ♂, emerged 10 p.m.; July 3, 1935, 1 ♂, emerged; June 16, 1936, 1 ♂;

June 22, 1936, 1 ♀, emerged (W. E. Ricker); July 7, 1936, 2 ♂; July 19, 1936, 1 ♀ (F. C. Whitehouse); Hope, B. C., Kakawara Lake, Aug. 5, 1936, 1 ♂ 1 ♀ (F. C. Whitehouse); Salmon Arm, B. C., July 12, 1935, 1 ♂ (in alcohol; E. R. Buckell).

Fig. 2 Outline of right side of head and pronotum of Macromia nymphs, viewed obliquely from above, to show the full prominence of the eye and upturned edge of pronotum: (a) *M. rickeri*; (b) *M. illinoiensis*.

I take pleasure in dedicating this species to Dr. W. E. Ricker, through whose energy in collecting and rearing both adults and nymphs have come to be known.

Nymph—(Fig. 1) Length, 30 mm.; length of abdomen, 19 (20 in exuv.); width 12.5 (11.5 in exuv.); width of head, 8: length of hind femur, 13: length of antenna, 4.75.

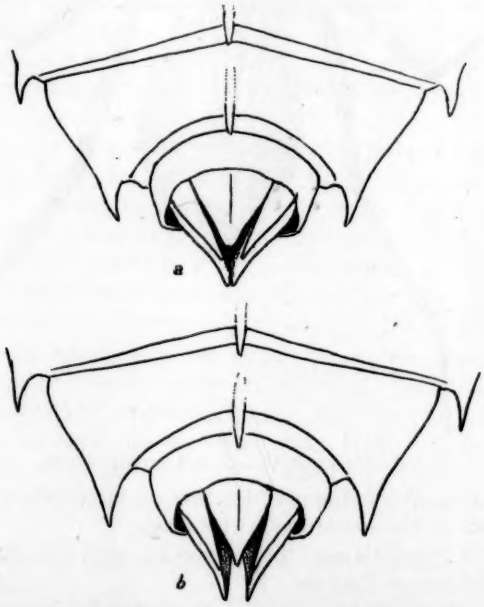

Fig. 3 Terminal segments of Macromia nymphs, showing lateral spines and anal appendages: (a) *M. rickeri*; (b) *M. illinoiensis*.

Head three-fifths broader than long, with short hairs, sparsely distributed except on the frontal horn and basal segments of antennae, where they are dense. Frontal horn acute, erect, the angle between its posterior surface and dorsum of head in front of eyes being approximately a right angle. Eyes very prominent, more so than in *illinoiensis* (fig. 2, a, b). Antennae with the first two segments thickened, the remaining segments tapering, the terminal ones being very slender: 1+2 slightly shorter than 3+4, 4+5 slightly longer than 3 and slightly shorter than 6+7. Tubercles on posterolateral angles of head very prominent, similar to those of *magnifica*, more sharply defined than in *illinoiensis* (fig. 2, a, b). Labium extending back to posterior surface of mesocoxae, the mentum constricted in its proximal fourth, slightly flaring distally, its greatest width slightly exceeding the length of one of the sides; mental setae usually 6 or 7 on each side, the four outermost closely crowded, the remainder more widely separated, and usually one to four shorter setae, more irregularly placed, on each side of the middle line; lateral setae 6 or 7; usually one, sometimes two setae at the base of each lateral lobe.

Pronotum with the lateral margins strongly bent upwards, more angulate than in *illinoiensis* (fig. 2).

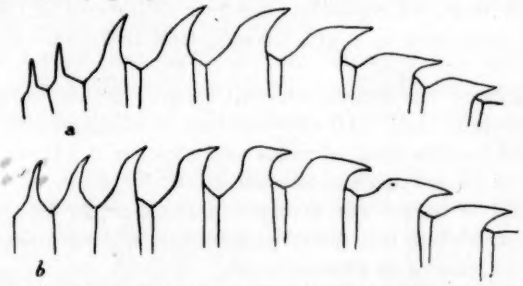

Fig. 4 Lateral view of dorsal hooks of Macromia nymphs: (a) *M. rickeri*; (b) *M. illinoiensis*.

Abdomen as in *magnifica*. As compared with *illinoiensis* the lateral spines of 8 and 9 are shorter and more incurved (fig. 3, a, b); those of 9 extend back beyond the middle of seg. 10 but not as far as the postero-ventral edge of 10, as they do in *illinoiensis*. The dorsal hooks (fig. 4, a, b) seem not to differ from those of *magnifica*. Those of segs. 2 and 3 are straight, slender, and erect, shorter than those of the following segments, which are successively wider (antero-posteriorly) at base, and more sharply bent backward. They differ from those of *illinoiensis* in that the dorsal margins, particularly of the middle segments, are not so prominently convex. In *illinoiensis* the hooks of segs. 5 and 6, seen in profile, suggest a bird's head, while in *rickeri* they are merely gently falcate. Both seg. 10 and epiproct are carinate.

Colour-pattern.—Conspicuously mottled with olivaceous brown and dull whitish, the prevailing colours being yellowish brown in alcoholic specimens, brownish grey in exuviae. Head chiefly dark with pale lateral blotches behind the eyes, tubercles whitish; labium pale, speckled and blotched with dark, most heavily on the lateral lobes. Synthorax mainly dark with pale patches at bases of legs and wings. Femora pale with three more or less irregular dark transverse bands, a basal (or sub-basal), a median, and an apical, the last longer than the others on

the middle and hind legs. Tibiae and tarsi irregularly speckled with pale and dark. Abdomen dark with pale blotches, the most definite forming two longitudinal rows on each side, an inner row along the mesial third of the distance from middle line to lateral margin, the outer row along the outer third of the same distance. The spots of the inner row are slightly the larger; they are proximal in position in each segment, the last pair being on seg. 10; the spots of the outer row are distal in position and the last pair is on seg. 9. There are also pale marginal intersegmental blotches and the dorsal hooks are likewise pale.

Material examined—Cultus Lake, May 28, 1933, 9 nymphs, all full grown. Exuviae: Cultus Lake, summer of 1933, 1 exuv.; June 22, 1935, 1 exuv. with adult; June 26, 1935, 1 exuv. with adult; June 28, 1935, 1 exuv. with adult; June 16, 1936, 1 exuv. with adult.

As compared with the nymph of *M. rickeri*, that of *magnifica*, of which I have one nymph and one exuvia (with adult), both from Christina Lake, B. C., the only difference I can detect is the paler coloration of *magnifica*, the dark areas being much less extensive than the pale ones. The two rows of pale spots on each side of the abdomen in *rickeri* are merged into the general pale background in *M. magnifica*. It is, however, improbable that such differences as these are constant, although they correspond, in a general way, with the colour differences in the adults.

KEY TO THE NORTH AMERICA SPECIES OF MACROMIA

1 Labrum yellow or only diffusely brownish at base, generally with the free margin black; middle tibiae of males with a keel on the flexor side; sup. apps. of male with an external lateral tooth ..... 2.

1' Labrum black or dark brown at base, the distal yellow area sharply defined, entire or divided into two spots; middle tibiae without a keel; sup. apps. of male with no trace of an external tooth ..... 8.

2 With no trace of antehumeral stripes ..... 3.

2' Antehumeral stripes or spots present ..... 4.

3 Fore tibia 9 mm., hind tibia 13 mm.; latero-ventral metathoracic carina narrowly yellow posteriorly; yellow ring on abd. seg. 2 not interrupted laterally or latero-ventrally; yellow area of seg. 7 in ♂ encircling the segment; meso-tibial keel one-seventh to one-fifth as long as the tibia ..... *alleghaniensis* Wmsn.

3' Fore tibia 7 mm., hind tibia 11 mm.; latero-ventral metathoracic carina brown; yellow ring on abd. seg. 2 interrupted laterally (♂) or latero-ventrally (♀); yellow area of seg. 7 in ♂ interrupted ventro-laterally; meso-tibial keel of ♂ about half as long as the tibia ..... *illinoiensis* Walsh.

4 Yellow spots on abd. segs. 3-6 in pairs, well separated mesially; antehumeral stripes less than half as long as the mesepisternum; costa variable. Males: yellow ring on 2 interrupted mid-dorsally; yellow spots on 4 less than half as long as the space between base of segment and transverse carina; no pale ventral areas on 7-9 ..... 5.

4' Yellow spots on abd. segs. 3-6 mesially confluent or separated by a median dark line only; antehumeral stripes variable; costa yellow. Males: yellow ring on 2 not interrupted mid-dorsally or by a narrow line only; yellow spot

on 4 at least half as long as the space between base of segment and transverse carina; segs. 7-9 usualy pale ventrally or with pale ventral spots ..... 6.

5 Costa dark; labrum obscure dull yellow. Male: a pair of small yellow basal spots on 8. Female: yellow spots on 3 extending from transverse carina scarcely one-third the distance to base of segment; paired yellow spots on 7 but no yellow or only a trace on 8 ..... *taeniolata* Rambur.

5' Costa yellow to the stigma; labrum a clearer yellow. Male: a single larger spot on 8. Female: yellow spots on 3 extending from transverse carina more than half way to base of segment; yellow area of 7 undivided, a pair of small yellow, sub-basal spots on 8 ..... *wabashensis* Wmsn.

6 Antehumeral stripe separated from antealar sinus by a space much greater than its own width; frons metallic blue-black, strongly contrasting with yellow postclypeus; dorsal yellow frontal spots isolated and rounded; frontal vesicle dark ..... *georgina* Say.

6' Antehumeral stripe separated from antealar sinus by a space about equal to its width; frons brownish, contrasting little with the yellow postclypeus; dorsal frontal spots occupying the entire surface except the median sulcus; frontal vesicle yellow or with a yellow spot ..... 7.

7 Ventrolateral metathoracic carina broadly yellow; yellow spots on 4-6 entire or at least not completely divided in mid-dorsal line; sup. apps. of ♂ widening from lateral tooth to before apex, which is broadly rounded ..... *annulata* Hagen.

7' Ventrolateral metathoracic carina usually brown, though rarely very narrowly yellow; yellow spots on 4-6 narrowly interrupted by black in the mid-dorsal line; sup. apps. of ♂ tapering from lateral tooth to apex ..... *pacifica* Hagen.

8 Frons dorsally yellow, except the brown median sulcus; yellow distal area of labrum undivided; costa yellow; antehumeral stripes at least half as long as mesepisterna; yellow areas on 3-6 large, occupying the entire space from transverse carina to base except a narrow basal line, not divided mesially .. *magnifica* McLachlan.

8' Frons dorsally dark with two widely separated yellow spots; yellow of labrum divided into two spots; costa brown; antehumeral stripes reduced to small spots much less than half as long as mesepisterna; yellow spots on 3-6 much smaller and decreasing caudad, well separated from base and more or less completely divided mesially ..... *rickeri* n. sp.

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CRITICAL NOTES ON THE CANADIAN SPECIES OF THE GENUS EREBIA (LEPID.)*

BY J. McDUNNOUGH,
Ottawa, Ont.

While rearranging our North American species of the genus *Erebia* in accordance with the recently published Monograph of the genus by B. C. S. Warren (1936) I was struck by the fact that in several instances our Canadian species had, especially as regards their areas of distribution, been treated in a rather superficial manner and with less of the thoroughness which marks the treatment of the balance of the species. This was probably due both to lack of material for study and of published distributional data; I offer therefore the following notes, based on the material in the Canadian National Collection, with a view to supplementing Warren's monumental work. The arrangement of species is that of the Monograph.

Erebia vidleri Elwes. The only other Canadian locality given by Warren besides the type locality (Mts. above Seton Lake, B.C.) is "near Lake Okanagan (Mrs. Nicholl)." Besides the series from Mt. McLean, Seton Lake already noted by me (1927, Can. Ent. LIX, 154), our collections contain series from Mt. Cheam, Lower Fraser Valley; Hope Mts. (6000 ft.); and the Mt. Apex region, this latter being the section in which Mrs. Nicholl collected, judging by some of her material before me (ex Coll. Wolley-Dod); there is also a single specimen from Aspen Grove. Roughly speaking therefore *vidleri* inhabits, as far as present knowledge goes, the area of southern British Columbia bounded east and west by the Fraser river and Lake Okanagan and extends into neighboring areas of Washington State, from where I have seen a few specimens. It is doubtful if the species descends much below 4000 ft.; it seems to prefer the more open woods below timber line where it may be found flitting about flowers or sucking moisture from damp spots on the road. Its time of flight is July but in early years occasional specimens occur in June and in some spots it may still occur in August: our earliest dates are June 15 (Upper Keremeos, Mrs. Nicholl) and June 28 (Aspen Grove) whilst our latest ones are August 15 and 17 (Mt. Cheam).

Erebia rossii Curt. In his treatment of this species Warren concludes (p. 160) that the typical race is confined to "the northern coast of the North West Territories and the Franklin Islands;" he cites a specimen in our collection from Wollaston Land, Victoria Island which was figured by Gibson in his Report of the Lepidoptera of the Canadian Arctic Expedition 1913-18 (1920, Part I, Pl. IV, fig. 9). He also, following Holland, cites Southampton Island for the typical form; these specimens have since been figured (1935, Mem. Carn. Mus. XII, Pt. II, Sec. 5, Pl. XXVIII, figs. 16-18), this publication being doubtless unissued at the time the Monograph went to press. To specimens from interior points of the Yukon and North West Territories and also to a specimen from Baffin Island (fig. 928) Warren applies the name *kuskoquima* Holl. which he treats as a subrace (so-called form) of the Asiatic race *erda* Shel.; contending that *erda* extends through Alaska and the interior northern portions of the Dominion as far east as Baffin Island.

*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture Ottawa.

After study of our material I cannot agree with Warren's conclusions. We possess 5 ♂, 3 ♀ (some of them in excellent condition) from Nettilling Lake, Baffin Island, July 7-12, and 6 ♂, 4 ♀ from Lake Harbor on Hudson straits July 15; further 6 ♂ from the Mackenzie Delta, July 17, and 4 ♂, 1 ♀ from Hanbury river (Thelon river region) July 6-8 captured by Hornby and Bullock. These, with the specimens mentioned by Gibson (*op. cit.*) and a single ♀ from the mouth of the Coppermine river, constitute what seems to me to be undoubtedly a series of typical *rossii*, characterized by the small ocelli of forewings (mostly confined to the two subcostal ones) and the general indistinct nature of the banding on the underside of the hind-wing. It seems impossible to refer any of these specimens to *kuskoquima* as Warren inclines to do; unfortunately there is only a single topotypical male of this latter race before me, but, in this specimen, exactly as Holland states, "the extradiscal band on the lower side of the secondaries, which in the typical form is obscure, is lighter;" one might add that the basal area is also much lighter and in consequence the median dark band stands out quite prominently, being much better defined than in any of the above-mentioned material. As to the relation between *kuskoquima* and *erda* I am unable to make any comments, lacking Asiatic material, but there seems no valid reason why the former name should not be used with full racial value for specimens from Western Alaska whilst the distribution of the typical race may be said roughly to extend along the whole northern fringe of the continent from the Mackenzie Delta to southern Baffin Island and inland in the Barren Grounds to a considerable extent. The specimens from Hudson Bay, recorded by Elwes, and which Warren (p. 162) inclined to place under *erda* have received the varietal name *ornata* Leuss. (1935, Bull. Brook. Inst. XXX, 50) since the Monograph was completed. These specimens are characterized by the increased number and enlargement of the ocelli, notably the subcostal ones on the primaries which frequently coalesce to form a black blotch whilst the banding on the underside of the secondaries remain obscure. There is a series of 11 ♂, 3 ♀ from Ft. Churchill, Man., the type locality, in our collection, and while most of them agree with the above characterization, a few males show scarcely any difference from typical *rossii*, especially when compared with the specimens from Hanbury river, which, both geographically and in habitus form more or less of a connecting link between *ornata* and the nimotypical race.

Erebia disa Thun. The nimotypical race of this species from northern Europe does not occur in North America as far as is known; judging by Warren's figures (figs. 968, 970) it has the median dark band on the underside of secondaries well-defined by pale inward and outward shading. Warren recognizes two North American races, *steckeri* Holl. from Alaska and *mancinus* West. from the eastern foot-hills of the Rocky Mts. With regard to the former we possess, besides a pair of paratypes, four worn topotypical males; as stated in the Monograph it is "closer to *disa* than any of the other subspecies" and characterized by the very dark median band on the underside of the hindwings as well as the much darker (dark chocolate) ground color of forewings. Warren is inclined to associate certain specimens from the Yukon and North West Territories, recorded by Gibson (*op. cit.* p. 17), under this subspecific name, but after a careful exam-

mation I find that the only specimen which might fall here is the male from Black river (Cairnes), a locality close to the Alaskan boundary, and even this on the upper side of the primaries has considerable similarity to *mancinus*.

The much larger var. *mancinus* West. is characterized by the reddish suffusion on the basal area of the forewings which renders the inner margin of the red submarginal band rather diffuse. The underside of the hindwing is generally quite unicolorous with the exception of a small white patch at outer angle of cell; certain specimens, however, especially in the more northern areas of its distribution, tend toward the distinct banding of *steckeri*. The species is not uncommon in Alberta on the eastern slopes of the Rocky Mts.; we have series from Lacombe, Banff, and Nordegg. It has also been reported from the northern boundary of British Columbia (Atlin) and specimens are before me from adjacent regions in the Yukon (Whitehorse). More to the east it occurs around Gt. Slave Lake, ranging northward (Gravel river) as far at least as Gt. Bear Lake. A pair of specimens from Dease Bay on this lake are characterized by their smaller size and better marked underside of hindwings and in this respect are matched by a female from Gravel river, although two males from this region are quite normal *mancinus*. Two males from Smoky Falls, Mattagami Riv., Northern Ontario, June 29, July 4 (G. S. Walley) constitute the most easterly record known to me.

Specimens from the extreme northern coast appear to be rare; judging, however, by three males before me from this region, a varietal name seems warranted for this form, which I characterize as follows:

Erebia disa var. **subarctica** var. nov.

Male. Smaller in size than *mancinus* with wing expanse (from tip to tip) of approximately 38 mm. Color of upper side a very deep chocolate-brown with a sharply defined, slightly curved, orange-red band on primaries, containing four blackish dots; *no reddish suffusion*. Fringes distinctly checkered. Primaries beneath much as on upper side with no reddish basal suffusion and in consequence a *sharp definition inwardly of the submarginal orange-red band;* the two upper dark spots in this band show minute white pupils (this may not be constant, but is not present in *mancinus*). A sprinkling of whitish scaling apically. Secondaries dark with considerable even sprinkling of white scales, somewhat less prominent, however, on the median dark band, the edges of which, together with the submarginal "*disa*-line," are quite well-defined. In consequence this *median band shows up more prominently* than is normally the case in *mancinus;* a small white patch beyond angle of cell.

Holotype—♂, Mackenzie Delta, N. W. T. July 17, 1924, (W. H. B. Hoare); No. 4118 in the Canadian National Collection, Ottawa.

Paratypes—1 ♂, Escape Rapid, Coppermine River, N. W. T., July 1, 1925, (W. H. Hoare); 1 ♂, Port Epworth, Coronation Gulf, N. W. T., July 15, 1915, (Can. Arct. Exp.).

From *steckeri* this new variety is at once distinguished by the lack of contrast between the median band and the remainder of the wing; in other maculation and in size it is quite similar.

Erebia mackinleyensis Gund. No mention is made by Warren of this recently

described species (1932, Can. Ent. LXIV, 278) but it will, in all probability, prove to be very close to the Asiatic *erinnyn* Warr. (*erynnis* Staud.) and at the best a race of same. Warren places (p. 177) the two Yukon specimens, mentioned by Gibson (*op. cit.* 18) as *magdalena* Stkr., under *erinnyn;* there is no doubt that the female from Nation River, July 24, agrees with a female paratype of *mackinleyensis* before me; the male (Aug. 2) is in too poor condition to place accurately. A second Yukon female of this species was erroneously figured by Gibson (*op. cit.* Pl. IV, fig. 7) as *fasciata* Butl., a note in the text stating that the band on the underside of secondaries was faint; this specimen was taken near the Alaskan boundary at an altitude of 1300 ft.

Erebia fasciata Butl. To the mainland localities listed by Gibson and Warren the following localities based on our material may be added: Bloody Falls and Escape Rapid, Coppermine river, N. W. T., 2 ♂, June 30, July 6, and Cariboo Crossing, Gt. Slave Lake region 1 ♂, July 27, this latter being the most southerly record for the species as yet. Attention is also called to Leussler's remarks on the species from the Mackenzie Delta region (1935, Bull. Brook, Inst. XXX, 49).

For the newly described ab. *suffusa* Warr. no types nor type-location are listed, the only specimen specifically mentioned being one loaned from the Canadian National Collection from Bernard Harbor, N. W. T. Under the circumstances I believe this must be considered to be the *Holotype* and I have so marked it; there are two further ♂ specimens from Armstrong Pt., Victoria Land and Bernard Harbor, N. W. T. in our collection.

Erebia avinoffi Holl., described as a new species, is shown by Warren to be a mixture of typical *fasciata,* the Asiatic race *semo* Gr. Gr., and an Alaskan form to which he restricts the name in a varietal sense, basing it on the ♀ Holotype (Holl. Butt. Book, Pl. LXI, fig. 7) and a ♂ figured as fig. 1004. The main points of distinction from typical *fasciata* are given on p. 180, under *semo,* of which *avinoffi* is made a form; Warren states "The true distinction between *semo* and *fasciata* lies on the underside. Here, as previously noted, the antemarginal bands on both wings in *semo* are much narrower than in *fasciata,* and all the bands are edged by a dark line, which is not present in *fasciata.*" He also mentions the widening of the costal portion of the antemarginal band on hindwings and the marginal band on forewings as characteristic. Such distinctions do not hold, however, invariably; our ♂ *suffusa* from Armstrong Pt. has quite as narrow antemarginal bands on underside as in Warren's fig. 1004, but with only slight costal expansion on secondaries and no emargination of the outer edge on primaries; further our Coppermine river males as well as the one from Lat. 66° 58' show a distinct dark edging to these bands which are otherwise of normal width; Leussler, too, notes variation in width of the band. More Alaskan material is needed to satisfactorily establish the correct status of *avinoffi.*

Erebia discoidalis Kby. The most easterly records available for this species are Smoky Falls, Mattagami river, N. Ontario (June 11-13) (G. S. Walley) and Sudbury, Ont. May 12, 1889 (ex Coll. Evans). We also have a few specimens from the Gt. Slave Lake region and it is listed by Leussler (*op. cit.* 48) from the Mackenzie Delta region.

Erebia theano Tausch. As races of this Asiatic species Warren recognizes *ethela* Edw., *canadensis* Warr. (*sophia* Stkr. preocc.) and *alaskensis* Holl.; he also describes a new race *demmia* Warr. from the San. Juan Mts., Colo. and in the appendix (p. 387/8) the ♀ form *churchillensis* Warr. Only *canadensis* Warr. from Churchill, Man. and *alaskensis* Holl. from the Yukon are known to occur in Canada and I have nothing further to add to Warren's remarks regarding these races.

Erebia youngi Holl. The only other record we have for this species besides those mentioned by Warren is Kay Point, Arctic Coast, Yukon, July 31 (W. H. B. Hoare). To these must be added Leussler's records (*op. cit.* p. 51).

Erebia herscheli Leuss. This recently described species is not mentioned by Warren; it is based on 3 ♂ from Herschel Is. and is related to *youngi* of which it may be a race according to Leussler. It is unrepresented in our collection.

Erebia epipsodea Butl. To the Yukon records given by Gibson may be added, Dawson, from which locality we have a small series; these specimens are somewhat smaller than normal and show a tendency towards diminution of the spots on secondaries.

Erebia callias Edw. This is treated as a good species and not as a race of *tyndarus;* it is as yet unreported from Canada. Warren records it "only from the mountains of New Mexico and Colorado" but to this must be added, Wyoming, as it occurs abundantly on the slopes of Mt. Washburn in the Yellowstone National Park.

A NOTE ON TWO SPECIES OF AMERICAN XYLITAS.

BY EDITH W. MANK,
Lawrence, Mass.

In collections of American beetles, we find, at present, only one recognized species of *Xylita,* namely *laevigata,* which occurs both in Europe and America. Mr. H. C. Fall recently called to my attention the fact that the specimens so named were not all alike. Upon examination it is found that in many cases two species have been grouped under this head, the true *Xylita laevigata* Hellenius and another which apparently is identical with the European *Xylita livida* Sahlbg. An examination and comparison of our form with specimens from abroad show no differences. A series of thirty-four beetles received from Mr. Ralph Hopping all proved to be *Xylita livida.*

The genus *Xylita* in which, in Europe, these two species are included is not limited as much as the genus has been in America, since it includes forms which have the middle coxae separated by a projection of the mesosternum as well as those where the middle coxae are contiguous. It seems wise at present to thus enlarge our conception of *Xylita* rather than to erect a new genus for *livida* which is found to occur in America.

In *Xylita* the antennae are slightly serrate from the fifth segment on. They are shorter than the head and thorax taken together. The maxillary palpi are not serrate but have a securiform terminal segment. The thorax is margined at the base and also laterally. On the underside, the prosternal sutures are present but they are flat and not elevated. The anterior coxal cavities have a lateral fissure with the trochantin visible. The anterior coxae are fairly promin-

ent in both the species that occur in America.

Among the Serropalpini, *Xylita* differs from *Anisoxya, Abdera, Dircaea,* and *Phloeotrya* in that the prosternal sutures are not elevated and the anterior coxal cavities have a lateral fissure. It is unlike *Serropalpus* in that the antennae are less than one-half the length of the body, the prosternum before the coxae is longer than in *Serropalpus,* and the maxillary palpi are not serrate. From *Amblyctis* and *Enchodes,* it may be separated by the terminal segment of the maxillary palpi which in *Xylita* is wider than the two preceding segments. From *Scotochroa* it differs in the fact that the lateral edge of the pronotum in *Xylita* is sharp more than half of the way to the anterior edge and the terminal segment of the maxillary palpus is not triangular. Finally, from *Rushia,* which it most closely resembles, we may separate *Xylita,* first, by general appearance, as *Xylita* is not long and flat, second, by the fact that the antennae are somewhat serrate from the fifth segment on instead of from the fourth as in *Rushia,* and third, because the anterior coxae are larger than in *Rushia,* and finally, since the last segment of the maxillary palpi is securiform.

Xylita laevigata Hellenius.

Head bent downward so that it is scarcely visible from above, front somewhat flattened, frontal suture indistinct. Antennae shorter than the head and thorax taken together, the first four joints cylindrical, the others slightly flattened and triangular and therefore appearing serrate. Maxillary palpi not at all serrate, the fourth joint securiform. Head thickly punctured. Thorax somewhat wider than long, thickly punctured, margined at the base and laterally to the front margin. The anterior edge of the thorax extends forward slightly, tending to cover the head which is bent downward. Two slight depressions near the base of the thorax. Elytra uniformly colored.

On the under side of the thorax, the prosternum before the anterior coxae not as long as the latter, the prosternum flattened at the middle; anterior coxae large; the suture between the prosternum and the episternum flat and not noticeably divergent anteriorly; anterior coxal fissure present. The middle coxae are contiguous. The abdominal segments gradually diminish in length, the first segment is margined laterally.

Xylita livida Sahlbg.

Head more finely punctured than in *laevigata;* frontal suture absent; prothorax shorter than in *laevigata* and therefore the head is more visible from above. Sides of pronotum sharply margined clear to the front edge; punctuation finer.

On the under side of the thorax, the prosternum is convex not flat; the length of the prosternum before the anterior coxae is as great as they are; anterior coxae not as large as in *laevigata.* The middle coxae are separated by a projection of the mesosternum. Elytra with a dark sutural streak.

OBITUARY

JOSEPH PERRIN

Canadian entomology has suffered another loss by the death of Joseph Perrin, who died at the age of 72 years on December 31st, 1936, at MacNabs Island, Halifax, N.S. The late Mr. Perrin came to Canada more than

forty years ago with his father, who purchased MacNabs Island, situated in Halifax harbour, and where the family since lived. During the greater portion of his life he had enjoyed good health. Last summer, however, he suffered from two strokes and a third stroke, from which he did not rally, occurred on the day of his death. He was a keen amateur entomologist, specializing in lepidoptera, and, in addition to maintaining a notable private collection, donated many specimens to the Canadian National Collection at Ottawa, and was a regular correspondent with the Entomological Branch for many years. His interest in entomology attracted the attention of the late Dominion Entomologist, Dr. James Fletcher, and he acted as an inspector of the Branch for many years, both before and after the establishment of Halifax as a port of importation for the inspection of nursery stock. During his lifetime he added materially to the knowledge of the lepidoptera of Nova Scotia; in 1912 he prepared with John Russell of Digby "A Catalogue of Butterflies and Moths Collected in the Neighbourhood of Halifax and Digby, N.S." which was published by the Nova Scotia Institute of Science. The late Mr. Perrin was a member of the Nova Scotia Entomological Society which later changed its name to the Acadian Entomological Society. His death means another gap in the ranks of that group of enthusiastic amateurs who did so much to advance the science of entomology in its earlier days in Canada, and a group which most unfortunately is not being maintained by the addition of younger men as amateurs who are devoted to the science for the great interest it provides.

LEONARD S. MCLAINE.

BOOK NOTICE.

The Origin of Higher Categories in *Cynips* by Alfred C. Kinsey (Ind. Univ. Publ. Sci. Ser. No. 4, 1936, pp. 334). Sold by University Bookstore, Bloomington, Ind. Price $2.50.

The present volume is complementary to an earlier work by the same author, "The Gall Wasp Genus Cynips" (Ind. Univ. Stud., XVI, Nos. 84-86, 1930) which treats with the species inhabiting United States. In his latest book Dr. Kinsey considers the extensive fauna of Mexico and Guatemala describing 70 species new to the genus. Both volumes involve the study of more than 35,000 insects and 124,000 galls or an average for each of the 165 species treated of 214 insects and 755 galls. The two volumes should be used in conjunction. The second in addition to the numerous descriptions of new species and additional distributional, morphological and host plant data concludes with an appendix containing a key to the complexes of the genus and a revised check list of species.

In studying the species inhabiting United States the author found that they could be arranged in numerous diverging lines or chains which when plotted geographically led through their more primitive species to a region in Southwestern United States or Northern Mexico: here the lines abruptly ended. This region was regarded by the author as the probable point of origin of the whole genus and the area in which had taken place the initial split into the ancestral stocks which gave rise to the subgenera and most of the complexes of the genus. An intensive study of the Mexican species substantiated this viewpoint by bringing together the diverging ends of the evolutionary lines in the United States into one continuous chain of existent species.

In his previous work Dr. Kinsey found species, as he regarded them, to exist in nature as realities in the form of populations with definite (though varying) morphological and physiological characteristics. In *Cynips* he believed the commonest method of origin of new species to be mutants isolated in some manner from the parental type. In the present study he concludes that all the higher categories (subgenera, complexes, etc.) are useful but artificial conventions "hardly real either in manner of origin or in their intrinsic qualities." The tree-like symbol of evolution is discarded in favor of a pattern in the form of an infrequently dividing chain in which the oldest species may remain coexistent with all its derivatives. Higher categories are defined as "arbitrarily limited groups of related species in a phylogenetic chain."

Dr. Kinsey's work is a plea for a more direct approach to evolutionary problems through an exhaustive study of our contemporary fauna throughout its entire range. He feels that most workers are too prone to speculate from restricted and inadequate data in the belief that most of the clues they seek lie buried in the fossil record, whereas in reality a thorough and extensive field study might reveal many surviving links in the phylogenetic series. G. S. WALLEY.

RESEARCH NOTES.

NOTE ON BORON DEFICIENCY IN SUGAR BEETS.

Insects or disease may sometimes be assumed to be responsible for certain injury found in sugar beets where the real trouble is due to boron deficiency in the soil. The question of boron deficiency in soils has become more prominent in recent years so in order to enable entomologists to recognize this trouble more readily Dr. H. D. Brown, of Chatham, Ontario, has been kind enough to furnish us with a brief note on the characteristics of this trouble and also his estimation of its prevalence and distribution.

Dr. Brown tells us that:—

"The disease usually makes its appearance early in August with the heart leaves blackening and dying off. The outer rosettes of leaves may continue green, but the heart leaves blacken, crinkle and die. New top growth is stopped, but adventitious leaves may develop around the dead crown. In severe cases the heart of the beet blackens and fungous infections may cause the whole beet to rot. A purpling under the epidermis of the beet is another sympton which can be used for early diagnosis of heart rot."

"Dry Rot or Heart Rot of sugar beets was credited to excess alkalinity of the soil since it was always found associated with soils having a.p.H of 7.3 or above. Early in 1933 a German investigator presented evidence that Boron Deficiency in the soil was responsible and that the infections found in the rotting beet (*"Phoma betae"* and *"Corticium Vagum"*) were secondary infections. These findings were taken up by plant pathologists in Great Britain, United States, Canada and elsewhere, and there seems to be universal acceptance of the relation of Boron deficiency to the Heart Rot of beets.

"Numerous fields with heart rot beets were found in 1936 and over 50 beet fields were reported with this condition in South Western Ontario. The diseased beets were usually confined to sandy knolls or leached ridges in the fields and

were most common in the alkaline soil areas. Experimental plots in several districts showed increased growth and healthy plants where 10 to 20 pounds of Borax per acre was applied with the fertilizer."

NEWS AND VIEWS

THE 73RD ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO

The annual meeting of the Entomological Society of Ontario was held on November 19th and 20th, 1936, at the Dominion Parasite Laboratory at Belleville, Ontario. The president, Mr. L. S. McLaine, was in the chair. The following papers were presented:

"The 1936 Grasshopper Outbreak in Ontario"—H. A. Gilbert and R W. Thompson.
"The Corn Borer in Ontario in 1936"—L. Caesar.
"The Actual Corn Borer Distribution in Quebec"—P. Lagloire.
"Preliminary Field Experiments in the Control of the European Corn Borer, *Pyrausta nubilalis* Hubn., by *Beauvaria bassiana* Vuill"—G. M. Stirrett, G. Beall, and M. Timonin.
"On the Phototropism of the June Bugs"—Geo. Maheux and Geo. Gauthier.
"Further Notes on the Flight of Phyllophaga"—Messrs. Hudson, Wood and Pritchard.
"Some Facts Regarding the Distribution of the Pea Moth, *Laspeyresia nigricana* Steph., on the Gaspe Coast"—A. D Baker.
"Resistance of Some Varieties of Peas to the Pea Aphid, *Illinoia pisi* Kalt."—J. B. Maltais.
"A Brief Report on Certain Mercury Salts used Experimentally against the Onion Maggot"—A. G. Dustan.
"The Sweet Clover Weevil"—H. W. Goble.
"Four Years Experience with 'Electracide' Light Traps"—D. F. Patterson.
"Some Interesting Captures from Electric Lights"—H. F. Hudson and A. A. Wood.
"An Occasional Outbreak of *Myzus persicae* around Quebec City"—Geo. Maheux.
"Life History and Habits of the Dusky Leaf Roller, *Amorbia humerosana* Clem. in Nova Scotia"—F. C. Gilliatt.
"The Muscles of the Head Stomodeum of an Odonate Nymph, *Ischnura verticalis*"—(Mrs.) Evelyn Grieve.
"The Biology of *Microplectron fuscipennis*, a parasite of the Spruce Sawfly"—W. A. Reeks.
"Preliminary List of Aquatic Insects of the Quebec District"—Geo. Gauthier.
"Further Observations on the Life History and Habits of the Columbine Borer, *Papaipema purpurifascia* G. & R."—W. G. Matthewman.
"Occurrence of the Potato Beetle in Three New Quebec Districts"—Geo. Maheux.
"Some Factors influencing the control of Greenhouse Aphids by Parasites"—J. H. McLeod.
"Biological Notes on the *Chrysopidae*"—Wm. L. Putnam.
"Fruit Insects of the Season"—W. A. Ross.
"The Grasshopper Situation in Manitoba in 1936"—A. V. Mitchener.
"Some Problems in the Control of the Alfalfa Snout Beetle, *Brachyrhinus ligustici* Linn."—Charles E. Palm.
"Some Observations on the Biology of the Apple Maggot"—J. A. Hall.
"Results from Organized Apple Maggot Control in Nova Scotia"—A. Kelsall.
"A Review of Some Recent Experimental Work with Derris and Pyrethrum"—J. P. Barrett.
"Pyrethrum and Derris Dusts"—A. Kelsall and H. T. Stultz.
"A Laboratory Apparatus for Determining the Relative Toxicity of Contact Dusts"—S. H. Payne & H. T. Stultz.
"Some Observations on the European Pine Shoot Moth"—A. H. MacAndrews.
"Recent Developments in the Administration of the Agricultural Pests Control Act"—G. E. Grattan.
"Developments in Vacuum Fumigation Practice at the Port of Montreal"—L. S. McLaine & H. A. U. Monro.

The Annual Dinner was served at the St. Thomas Parish Hall, Bridge Street. All members, together with their wives and lady friends, attended.

A Public Meeting was held in the Auditorium of the Belleville Collegiate Institute. The guest speaker was Dr. W. C. O'Kane, Professor of Entomology, New Hampshire State University, Durham, N.H., who chose as his subject, "Looking Ahead."

SAP STREAM CARRIES POISON TO CONTROL BEETLES IN TREES.

A recent press release from Washington, D. C., informs us that, searching for new and better control measures, entomologists of the U. S. Department of Agriculture have worked out promising methods for introducing into the sap stream of an infested tree chemicals poisonous to bark beetles. The rising sap carries these chemicals—zinc chloride and copper sulphate—all through the tree, impregnating the tissues much more simply and at far less cost than could be done with an outside force.

Besides killing all insect life in the tree, the injected fluid makes the wood immune to further insect attack. Treated trees, therefore, may be left standing for several years, until it is convenient to start logging operations in their vicinity. Furthermore, posts, poles, and logs in the round from the treated trees will resist insect attack and decay that soon ruin untreated timber in contact with the ground. As a method of preserving forest products, the entomologists say, these treatments can not take the place of commercial dipping and pressure processes. They are, however, practical for farmers and foresters needing rough timber for fences or for rustic furniture, cabins, or bridges on the land where the trees grew. Nor can these methods of destroying insect pests be used on trees to be kept alive. They are bound to kill the tree, as well as the beetles in it.

A tree to be treated must be green and its crown must be left intact during the treatment. The simplest method—adapted to small trees—is to cut the tree off at its base, lodging the top in the crown of another tree, or in some other support to keep it upright, and set it in a pail of the solution. With trees too large to handle this way, the bark is removed from around the base. Then a notch is sawed through several annual layers of wood in the centre of the smooth, bark-free strip and a wide rubber band is stretched around the notch. The solution is run under the band into the notch.

Zinc chloride and copper sulphate have given best results in the department's tests for the last 10 years. Concentrations of 1 pound of the powdered chemical to ½ gallon of water for each cubic foot of wood in the tree stem have proved most satisfactory. The time required for the treatment varies with the physiological activity of the tree, particularly the rate of transpiration.

CHANGES IN U. S. MEXICAN FRUIT FLY QUARANTINE.

The Mexican Fruit Fly Quarantine No. 5 (Foreign) which has prohibited the entry into the United States of oranges, grapefruit, sweet limes, mangoes, achras, sapotes, peaches, guavas, and plums since 1913 will be lifted December 1, 1936, according to an announcement by the United States Department of Agriculture. On that date the entry of these fruits from Mexico automatically falls under the provisions of the Fruit and Vegetable Quarantine No. 56 (Foreign) which provides that they may enter only when so treated as to eliminate pest risk.

The Department also announced a revision of the regulations under the Fruit and Vegetable Quarantine No. 56 to take effect at the same time the Mexican Fruit Fly Quarantine is lifted. These changes clarify provisions on the entry of certain products so treated as to eliminate the risk of introducing injurious pests or of products which may be admitted subject to prescribed safeguards.

The new regulations contain no specific limitations as to ports of entry, leaving them to be prescribed in the permits.

U. S. REVOKES SATIN MOTH QUARANTINE.

A press release from the Department of Agriculture at Washington, D. C., under date of November 4th, 1936, states that the satin moth quarantine (Federal plant quarantine No. 53) which became effective January 1, 1922, to prevent the spread of the satin moth (*Stilpnotia salicis* L.), has been revoked, effective November 2, 1936. This quarantine affected parts of all the New England States and the state of Washington.

Lee A. Strong, Chief of the Bureau of Entomology and Plant Quarantine, says that when the quarantine was placed by the Department the known infested area lay within the area regulated by the gypsy moth and brown-tail moth quarantine and there was an organization at hand, therefore, for quarantine enforcement purposes. This condition has ceased to be true and at the present time there are no Federal facilities for the enformement of quarantine regulations in Oregon and Washington, where the insect has become established, in Oregon only recently. Mr. Strong also states that because of the effectiveness of several native and introduced insect parasites in reducing the intensity of infestation and because of the relatively minor commercial economic value of the host plants,—principally the poplars and willows—it is doubtful if the satin moth will ever become a very serious pest in this country, although local control measures for the protection of foliage of shade or ornamental host plants may be required from time to time.

The revocation of the quarantine will leave States free to take such action as they may desire to prevent the further spread of the satin moth.

MAILED MONDAY, JANUARY 25TH, 1937.